

1 We claim:

2 1. A free weight assistance and training device comprising:

3  
4 a base;

5  
6 a generally upright weight support structure mounted on and  
7 extending upwards from and over said base;

8  
9 a free weight support bar;

10  
11 a computer-controlled weight tensioning device mounted on said base  
12 generally adjacent said upright weight support structure;

13  
14 at least two cables movably mounted on said upright weight support  
15 structure and extending between and connecting said free  
16 weight support bar and said computer-controlled weight  
17 tensioning device;

18  
19 said computer-controlled weight tensioning device, said at least  
20 two cables and said free weight support bar operatively  
21 cooperating such that tensioning force applied by said  
22 computer-controlled weight tensioning device via said at least  
23 two cables to said free weight support bar controllably  
24 decreases the amount of downwards force exerted by said free  
25 weight support bar due to the weight of said free weight  
26 support bar and weights thereon whereby a user of said free  
27 weight assistance and training device may receive assistance  
28 during lifting of said free weight support bar via said

1 computer-controlled weight tensioning device.

2  
3 2. The free weight assistance and training device of claim  
4 1 wherein said base comprises at least two base feet having  
5 leveling pads mounted on the undersides thereof.

6  
7 3. The free weight assistance and training device of claim  
8 1 wherein said generally upright weight support structure comprises  
9 at least one main weight support post mounted on and extending  
10 upwards from said base, and at least one weight support beam  
11 mounted atop each of said at least one main weight support posts  
12 and extending forwardly therefrom.

13  
14 4. The free weight assistance and training device of claim  
15 1 wherein said free weight support bar further comprises a handle  
16 grip sensing device mounted on said free weight support bar and in  
17 information transmission connection with said computer-controlled  
18 weight tensioning device, said handle grip sensing device operative  
19 to ensure that said free weight support bar is being gripped by a  
20 user of said free weight assistance and training device, and upon  
21 detecting release of said free weight support bar by a user,  
22 vertical movement of said free weight support bar is restricted via  
23 said computer-controlled weight tensioning device until said free  
24 weight support bar is again gripped by a user.

25  
26 5. The free weight assistance and training device of claim  
27 4 wherein said handle grip sensing device on said free weight  
28 support bar further comprises a pair of light-sensitive sensing

1 units mounted on said free weight support bar, one adjacent each of  
2 a left and right weight stop and each facing inwards towards the  
3 center of free weight support bar, a pair of reflective disks  
4 movably mounted on said free weight support bar generally adjacent  
5 the center thereof, said reflective disks adapted for movement  
6 towards or away from said light-sensitive sensing units, each of  
7 said light-sensitive sensing units operative to send infrared beams  
8 of light outwards therefrom extending generally parallel with said  
9 free weight support bar towards said pair of reflective disks, the  
10 infrared beams being reflected back to said light-sensitive sensing  
11 units thereby signifying that non-use of said free weight  
12 assistance and training device, and alternatively, upon use of said  
13 free weight assistance and training device and placement of a  
14 user's hands on said free weight support bar, the infrared beams  
15 are interrupted, said light-sensitive sensing units signaling said  
16 computer-controlled weight tensioning device to confirm use and  
17 permitting movement of said free weight support bar.

18  
19       6. The free weight assistance and training device of claim  
20 1 wherein said computer-controlled weight tensioning device further  
21 comprises a computer-based control mechanism at least including a  
22 hard drive, motherboard with processor, memory, and software  
23 programmed to perform specified computing operations.

24  
25       7. The free weight assistance and training device of claim  
26 1 wherein said computer-controlled weight tensioning device  
27 comprises at least two cable reels mounted on rotatably mounted  
28 reel shafts operative to permit said at least two cable reels to

1 rotate to extend or retract said cables which are wound thereon,  
2 the cable reel surface of each of said at least two cable reels  
3 being threaded to generally ensure accurate take-up of said cables  
4 such that each rotation of said at least two cable reels takes up  
5 a generally identical length of said cable.

6  
7       **8.** The free weight assistance and training device of claim  
8 **7** further comprising at least two drive motors each having a drive  
9 shaft, each drive shaft of said at least two drive motors  
10 operatively connected to one of said at least two cable reels for  
11 rotation thereof in response to rotation of said drive shafts,  
12 said computer-controlled weight tensioning device further including  
13 at least two clutches each interposed between one of said drive  
14 shafts and one of said at least two cable reels such that said at  
15 least two clutches alternatively engage and disengage said drive  
16 shafts with said at least two cable reels for winding and unwinding  
17 said cables on said at least two cable reels.

18  
19       **9.** The free weight assistance and training device of claim  
20 **8** further comprising at least two sensor units each mounted  
21 generally adjacent one of said at least two reel shafts, said at  
22 least two sensor units operative to detect the rotational speed,  
23 direction and amount of rotation of each of said at least two reel  
24 shafts, said at least two sensor units in information transmission  
25 connection with said computer-controlled weight tensioning device  
26 for transfer of said rotational speed, direction and amount of  
27 rotation information thereto.

1       **10.** The free weight assistance and training device of claim  
2 **9** wherein said at least two sensor units each comprise a rotatable  
3 optical disk each connected to one of said at least two reel  
4 shafts, said optical disks each including alternating light and  
5 dark radial sections, said at least two sensor units further  
6 including sensor devices operative to count the number and speed of  
7 the rotations of said optical disks via said alternating light and  
8 dark radial sections and forward that information to said computer-  
9 controlled weight tensioning device whereby the speed, direction  
10 and number of rotations of each of said at least two reel shafts is  
11 processable by said computer-controlled weight tensioning device.  
12

13       **11.** The free weight assistance and training device of claim  
14 **10** further comprising a lift motor operative to engage said at  
15 least two reel shafts via said clutches such that said lift motor  
16 rotates said at least two reel shafts and said at least two cable  
17 reels to wind said at least two cables to alternatively raise and  
18 lower said free weight support bar by overpowering said drive  
19 motors.  
20

21       **12.** The free weight assistance and training device of claim  
22 **11** further comprising at least two reel brakes operatively  
23 associated with said at least two reel shafts to alternatively  
24 permit and prevent rotation of said at least two reel shafts to  
25 wind and unwind said at least two cables.  
26

27       **13.** The free weight assistance and training device of claim  
28 **1** further comprising a balance pad positioned generally below said

1 free weight support bar on a floor surface and connected in  
2 information transmission connection with said computer-controlled  
3 weight tensioning mechanism, said balance pad operative to track  
4 the weight distribution of a user of said free weight assistance  
5 and training device during the lifting of said free weight support  
6 bar for increasing efficiency of the lift.

7  
8 **14.** The free weight assistance and training device of claim  
9 **1** further comprising a bar position detector device including two  
10 interconnected elements, a cable angle detection device and a bar  
11 position detection light curtain, each connected in information  
12 transmission connection with said computer-controlled weight  
13 tensioning mechanism, said cable angle detection device and said  
14 bar position detection light curtain cooperating to determine the  
15 position of said free weight support bar during a lift, said cable  
16 angle detection device mounted on said generally upright weight  
17 support structure generally adjacent each of said cables to detect  
18 the angles at which said cables depend from said generally upright  
19 weight support structure, said cable angle being computed in  
20 combination with the length of said cables to track the location of  
21 the free weight support bar thereby permitting the user of said  
22 free weight assistance and training device to maintain a better  
23 lift track during the lift thus reducing the chance of injury from  
24 improper lifting.

25  
26 **15.** The free weight assistance and training device of claim  
27 **14** wherein said bar position detection light curtain is mounted on  
28 said generally upright weight support structure generally adjacent

1 an upper section thereof and extending generally horizontally, said  
2 bar position detection light curtain operative to project a light  
3 curtain generally vertically downwards to a receiver bar mounted  
4 adjacent said base, said bar position detection light curtain  
5 further operative to detect interruption of said light curtain and  
6 transmit the horizontal location of the interruption to said  
7 computer-controlled weight tensioning mechanism such that as said  
8 free weight support bar is moved through said bar position  
9 detection light curtain, the horizontal interruptions of the light  
10 curtain are recorded and the computer-controlled weight tensioning  
11 mechanism can calculate and graph the horizontal path of said free  
12 weight support bar during a lift.

1       **16.** A free weight assistance and training device comprising:

2  
3 a base;

4  
5 a generally upright weight support structure mounted on and  
6 extending upwards from and over said base;

7  
8 a free weight support bar;

9  
10 a computer-controlled weight tensioning device mounted on said base  
11 generally adjacent said upright weight support structure;

12  
13 at least two cables movably mounted on said upright weight support  
14 structure and extending between and connecting said free  
15 weight support bar and said computer-controlled weight  
16 tensioning device;

17  
18 rotatably mounted reel means operatively connected to said  
19 computer-controlled weight tensioning device for winding said  
20 at least two cables thereon to extend and retract said at  
21 least two cables;

22  
23 drive means operatively connection with said reel means for  
24 rotation thereof;

25  
26 at least one sensor unit operatively connected to said computer-  
27 controlled weight tensioning device and said reel means  
28 operative to detect rotation of said reel means and signal



1       said computer-controlled weight tensioning device regarding  
2       speed and direction of rotation of said reel means;

3  
4   said computer-controlled weight tensioning device, said at least  
5       two cables, said reel means, said sensor means and said free  
6       weight support bar operatively cooperating such that upon  
7       detection of stoppage of rotation of said reel means by said  
8       sensor means prior to completion of a lift, tensioning force  
9       is applicable by said computer-controlled weight tensioning  
10       device via said at least two cables to said free weight  
11       support bar to controllably decrease the amount of downwards  
12       force exerted by said free weight support bar due to the  
13       weight of said free weight support bar and weights thereon  
14       whereby a user of said free weight assistance and training  
15       device may receive assistance during lifting of said free  
16       weight support bar prior to completion of a lift via said  
17       computer-controlled weight tensioning device.

1       **17.** A free weight assistance and training device comprising:  
2  
3 a base;  
4  
5 a generally upright weight support structure mounted on and  
6       extending upwards from and over said base;  
7  
8 a free weight support bar;  
9  
10 a weight tensioning device mounted on said base generally adjacent  
11       said upright weight support structure;  
12  
13 a computer-based control device operatively connected to said  
14       weight tensioning device, said computer-based control device  
15       including software programming operative to control engagement  
16       and disengagement of said weight tensioning device in response  
17       to selected movement of said free weight support bar;  
18  
19 at least two cables movably mounted on said upright weight support  
20       structure and extending between and connecting said free  
21       weight support bar and said weight tensioning device;  
22  
23 rotatably mounted reel means operatively connected to said weight  
24       tensioning device for winding said at least two cables thereon  
25       to extend and retract said at least two cables;  
26  
27 drive means operatively connection with said reel means for  
28       rotation thereof;

1 at least one sensor unit operatively connected to said weight  
2 tensioning device, said computer-based control device and said  
3 reel means, said at least one sensor unit operative to detect  
4 rotation of said reel means and signal said computer-based  
5 control device regarding speed and direction of rotation of  
6 said reel means;

7  
8 said computer-based control device, said weight tensioning device,  
9 said at least two cables, said reel means, said sensor means  
10 and said free weight support bar operatively cooperating such  
11 that upon detection of stoppage of rotation of said reel means  
12 by said sensor means prior to completion of a lift, said  
13 computer-based control device commands said weight tensioning  
14 device to apply tensioning force to said free weight support  
15 bar via engagement of said drive means to apply rotational  
16 force to said reel means thus tensioning said at least two  
17 cables connected to said free weight support bar to  
18 controllably decrease the amount of downwards force exerted by  
19 said free weight support bar due to the weight of said free  
20 weight support bar and weights thereon whereby a user of said  
21 free weight assistance and training device may receive  
22 assistance during lifting of said free weight support bar  
23 prior to completion of a lift.